MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

SUPPLEMENTARY EXAMINATION

TRIMESTER 1, 2015/2016

PMT0101 – MATHEMATICS I

(Foundation in Information Technology)

17 NOV 2015
2.30 PM – 4.30 PM
(2 HOURS)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 5 pages with **FIVE** questions.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided.
4. **No calculators are allowed**.

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You are required to write proper steps.

ANSWER ALL QUESTIONS.

QUESTION 1 [10 marks]

(a) Simplify the expression and write your final expression as a fraction with no negative exponent.

$$\frac{2a^2b^{-2}}{\left(6ab^6\right)^2}$$

(2 marks)

(b) Simplify the expression and write your final expression as a single term.

$$\sqrt{12x}-\sqrt{48x}\,.$$

(2 marks)

(c) Perform the indicated operation and write the final result in the standard form $a+bi$.

$$\frac{4-i\sqrt{3}}{5+i\sqrt{3}}.$$

(2 marks)

(d) Factorize the following

(i) $\left(x^2-4\right)$

(ii) $\left(x^2-3x-10\right)$.

Hence simplify $\dfrac{4}{\left(x^2-4\right)}-\dfrac{7}{\left(x^2-3x-10\right)}$. (4 marks)

Continued .....

QUESTION 2 [10 marks]

(a) Solve the quadratic equation $(x-1)^2+4=0$. Any complex root in your final answer should be given in the standard form $a+bi$.

(2 marks)

(b) (i) Solve the inequality $\dfrac{3-x}{3x-2} \geq 0$.

Give your final answer in interval notation.

(ii) Find the domain of the function $f(x)=\sqrt{\dfrac{3-x}{3x-2}}$

Give your final answer in interval notation.

(3 marks)

(c) Solve the equation $|3x-1|=8$.

(2 marks)

(d) Solve the equation $x-1=\sqrt{3x+1}$. Remember to check your answers.

(3 marks)

Continued .....

QUESTION 3 [10 marks]

(a) Given the functions $f(x)=\dfrac{1}{x-1}$ and $g(x)=\sqrt{4-x}$,

find

(i) the domains of f and g, giving your final answers in interval notation.

(ii) the value of $(f\circ g)(0)$.

(iii) $f^{-1}(x)$, giving your final answer in the form $\dfrac{p(x)}{q(x)}$ where $p(x)$ and $q(x)$ are polynomials. (5 marks)

(b) Suppose a polynomial function $f(x)=-\dfrac{1}{2}(x-1)^2(x-3)(x+3)(x+5)$.

(i) What is the **degree** of f?

(ii) Find **the zeros** of f **and their multiplicities**.
At each zero, determine whether the graph of f crosses or touches the x-axis.

(iii) Find the y-intercept of f.

(iv) Determine the end behavior of f.

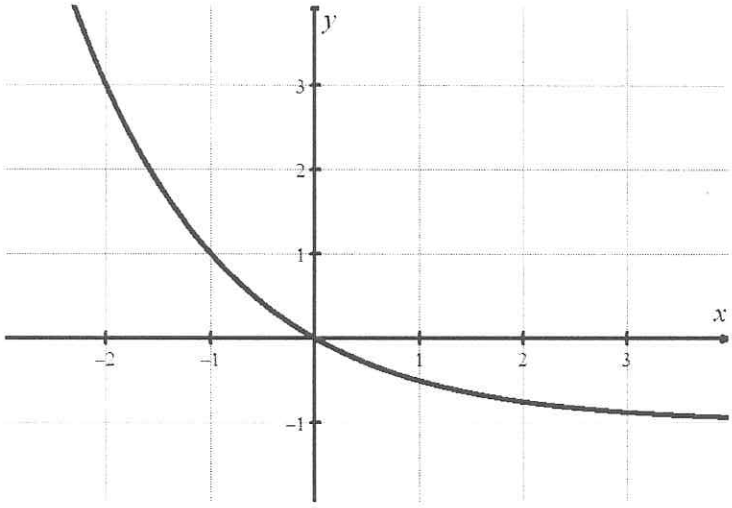
(v) Sketch the graph of the function f. Show all its intercepts and its end behavior.

(5 marks)

Continued .....

QUESTION 4 [10 marks]

(a) The figure below shows a graph of $f(x) = 2^{ax} + b$, where a and b are some numbers.



(i) Determine the values of a and b.

(ii) State whether f is a one-to-one function.

(iii) Write down the range of f in interval notation.

(4 marks)

(b) (i) Write $f(x) = x^2 - 4x + 2$ in the standard form $(x-h)^2 + k$ where h and k are some constants.

(ii) Determine the vertex and the y-intercept of the graph of $f(x) = x^2 - 4x + 2$.

(iii) Sketch the graph of $y = x^2$ and the graph of $f(x) = x^2 - 4x + 2$ on the same axes. Indicate clearly the vertex and y-intercept of the second graph.

(3 marks)

(c) Use long division to find the quotient and the remainder when the polynomial $3x^3 + 13x^2 - 3x - 45$ is divided by $x^2 + 6x + 9$.
You are required to state clearly what the quotient and the remainder are.

(3 marks)

Continued .....

QUESTION 5 [10 marks]

(a) Rewrite the sum $\sum_{k=2}^{5}(4k+1)$ without the sigma notation and then evaluate the sum.

(2 marks)

(b) Consider the following infinite geometric series.

$$2-\frac{4}{3}+\frac{8}{9}-\frac{16}{27}+\cdots$$

Determine the common ratio and decide whether the series is convergent or divergent. If it is convergent, find its sum.

(3 marks)

(c) Find, in terms of k, the slope of the straight line $6x+ky+5=0$.
Find the value of k if the two straight lines $6x+ky+5=0$ and $3x+y-2=0$ are perpendicular.

(2.5 marks)

(d) By completing-the-square method, transform the equation of the circle

$$x^2+y^2-4x+6y+8=0$$

to the form $(x-a)^2+(y-b)^2=r^2$.
Hence, find the centre and radius of the circle.

(2.5 marks)

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